L

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,207	09/15/2003	Albert Chan	02EK-105601	2364

30764 7590 07/12/2007

SHEPPARD, MULLIN, RICHTER & HAMPTON LLP
333 SOUTH HOPE STREET
48TH FLOOR
LOS ANGELES, CA 90071-1448

EXAMINER	
GOFF II, JOHN L	

ART UNIT	PAPER NUMBER
1733	

MAIL DATE	DELIVERY MODE
07/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/663,207
Filing Date: September 15, 2003
Appellant(s): CHAN, ALBERT

MAILED
JUL 12 2007
GROUP 1700

Julianne M. Sullivan
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed March 20, 2007 appealing from the Office action mailed June 28, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

Claims 1, 3, 4, 6, 7, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Jayaraman et al.

It is noted claim 33 was inadvertently left out of the rejection heading in the Final Rejection mailed 6/28/06. However, the rejection specifically addressed claim 33 such that the claim is added to the rejection heading at this time and is not a new grounds of rejection.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

Listing of the Prior Art of Record

2001/0038093	NGUYEN	11-2001
6,926,955	JAYARAMAN et al.	8-2005
5,128,746	PENNISI et al.	7-1992
6,265,471	DIETZ	7-2001
6,906,413	BISH et al.	6-2005
WO 97/07542	KIRSTEN	2-1997
2001/0030062	McCORMACK et al.	10-2001
JP2001284401	Nakajima	10-2001
20030150604	KONING et al.	8-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3, 4, 6, 7, 9-13, 16, 17, 19-23, 28, 29, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Nguyen (U.S. Patent Application Publication 2001/0038093).

Nguyen discloses a method of attaching an electronic component (e.g. heat producing integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink a component which has a different coefficient of thermal expansion than an IC chip) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Nguyen teaches the adhesive comprises a liquid

curable polymer (e.g. silicon-based and liquid at room temperature), fusible filler such as solder powder (e.g. Sn/Bi, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), fluxing agent, and non-fusible filler (e.g. copper or silver metallic particles having a high melting point, particle size of 0.02 to 0.1 mm, and thermal conductivities of 400 W/mK or more). Nguyen teaches that during application the adhesive is heated to above the melting point of the solder powder and the curing temperature of the curable polymer to cure the adhesive and form the adhesive into a compliant material (Paragraphs 6-8, 14, 15, 20-23, 26, and 30-32).

Regarding the limitation "thereafter curing the polymer matrix such that the adhesive paste hardens", Nguyen teaches the adhesive is cured to form a compliant material, i.e. a hardened material having elasticity, and appellants specification in paragraph 22 specifically notes "Finally, after being cured the polymer should provide good adhesion and have sufficient elasticity to absorb any stresses generated by thermal cycling or other mechanical causes." (Emphasis added) such that (inherently) curing the adhesive in Nguyen to form a compliant material hardens the adhesive from the liquid curable adhesive paste to the compliant material.

Regarding the limitation "such that the solder reflows to form interconnecting metal structures dispersed in the polymer matrix prior to the time the polymer becomes cured", Nguyen teaches an adhesive mixture comprising a curable polymer composition, a solder powder, and a fluxing agent wherein during application the adhesive is heated above the melting point of the solder powder and the curing temperature of the curable polymer for a time sufficient to cure the polymer (See each of the examples). Thus, as the materials and steps of Nguyen are the same as those both claimed and disclosed in appellants specification which result in reflow of the solder

powder to form interconnecting metal structures while the curable polymer composition is cured the limitation is considered inherent to Nguyen.

Regarding claim 10, Nguyen does not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable such that it is considered inherent that the adhesive is formed at less than 80 °C.

Claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. (U.S. Patent 6,926,955) in view of any one of Kirsten (WO 97/07542), the background of McCormack et al. (U.S. Patent Application Publication 2001/0030062), or Pennisi et al. (U.S. Patent 5,128,746).

Jayaraman et al. disclose a method of attaching an electronic component (e.g. heat generating integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink including those that are actively cooled which has a different coefficient of thermal expansion than an IC chip) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Jayaraman et al. teach the adhesive comprises a liquid curable polymer (e.g. epoxy or silicon-based), fusible filler such as solder powder (e.g. Sn/Bi, Sn/Pb, Sn/Ag, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK), and non-fusible filler (e.g. silver metallic particles having a high melting point and a thermal conductivity of 400 W/mK or more). Jayaraman et al. teach that after application the adhesive is heated to above the temperature of the solder powder to melt the solder powder and reflow the solder to form interconnecting metal structures and cure the adhesive followed by cooling the adhesive (Figures 3 and 4 and Column 3, lines 34-38 and 49-66 and Column 4, lines 9-19 and 49-56 and

Column 5, lines 33-56 and Column 6, lines 22-47 and 57-61). Jayaraman et al. do not specifically teach including a fluxing agent in the adhesive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include within the adhesive taught by Jayaraman et al. a fluxing agent to remove surface oxides from the solder powder and allow the solder powder to better wet out as was well known in the art and shown for example by any one of Kirsten, the background of McCormack et al., or Pennisi et al.

Kirsten discloses a method for bonding electronic components using a dispensable liquid curable adhesive paste including a solder reflow process to form interconnecting metal structures followed by curing the adhesive. Kirsten teaches the adhesive comprises a liquid curable polymer (e.g. epoxy), fusible filler such as solder powder (e.g. Sn/PB, etc. having a melting point less than 235 ^{o}C and a thermal conductivity greater than 20 W/mK), and fluxing agent. Kirsten teaches the fluxing agent is added to remove surface oxides from the solder powder and allow the solder powder to better wet during reflow and curing of the adhesive (Page 3, lines 6-8 and Page 13, lines 4-38 and Page 17, lines 11-37). The background of McCormack et al. discloses a dispensable liquid curable adhesive paste used in bonding electronic components comprising a curable polymer, fusible filler such as solder powder (e.g. Sn/PB, etc. having a melting point less than 235 ^{o}C and a thermal conductivity greater than 20 W/mK), and fluxing agent. The background of McCormack et al. teach the fluxing agent is added to remove surface oxides from the solder powder (Paragraph 2). Pennisi et al. disclose a method for bonding electronic components including solder interconnects through a dispensable liquid curable adhesive paste wherein the adhesive includes fluxing agent to remove surface oxides from the solder powder

and allow the solder powder to better wet during reflow and curing of the adhesive (Column 2, lines 61-64 and Column 3, lines 9-19 and 57-65).

Regarding the limitation "thereafter curing the polymer matrix such that the adhesive paste hardens", Jayaraman et al. specifically teach that below the operating temperature of the bonded electronic component the adhesive is solid, i.e. hardened, (Column 4, lines 33-35) such that cooling of the cured adhesive as taught by Jayaraman et al. during bonding hardens the adhesive and the limitation is met.

Regarding claim 10, Jayaraman et al. do not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable after forming such that it appears the adhesive is formed at room temperature and the limitation is met. In the event it is shown this limitation is not intrinsic the following rejection would apply. It would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine the optimum forming temperature for the adhesive taught by Jayaraman et al. as modified by any one of Kirsten, the background of McCormack et al., or Pennisi et al. as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claim 33, Jayaraman et al. do not specifically teach the curing temperature of the curable polymer is lower than the melting point of the solder. However, as the materials taught by Jayaraman et al., i.e. silicone or epoxy curable polymer and Sn/PB solder, are consistent and in agreement with those claimed and disclosed by appellants specification it appears intrinsic to Jayaraman et al. that the curing temperature of the curable polymer is lower than the melting point of the solder. In any event, absent any unexpected results it would have been obvious to one or ordinary skill in the art at the time the invention was made to use as the

curable polymer and solder powder any of those taught by Jayaraman et al. as modified by any one of Kirsten, the background of McCormack et al., or Pennisi et al. including combinations resulting in the curing temperature of the curable polymer lower than the melting point of the solder as doing so would have required nothing more than ordinary skill and routine experimentation.

Claims 1, 3, 4, 6, 7, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Jayaraman et al.

Nguyen is described above in full detail. As noted above it appears reflow of the solder material to form interconnecting metal structures is intrinsic to Nguyen. In any event, it would have been obvious to one of ordinary skill in the art at the time the invention was made that during the melting of the solder powder and curing of the adhesive taught by Nguyen the solder powder would reflow to form interconnecting metal structures in the adhesive as was known to occur in the art for similar processes as shown by Jayaraman et al.

Jayaraman et al. is described above in full detail.

Regarding the limitation "thereafter curing the polymer matrix such that the adhesive paste hardens", Nguyen teaches the adhesive is cured to form a compliant material, i.e. a hardened material having elasticity, and appellants specification in paragraph 22 specifically notes "Finally, after being cured the polymer should provide good adhesion and have sufficient elasticity to absorb any stresses generated by thermal cycling or other mechanical causes." (Emphasis added) such that (intrinsically) curing the adhesive in Nguyen as modified by

Jayaraman et al. to form a compliant material hardens the adhesive from the liquid curable adhesive paste to the compliant material.

Regarding claim 10, Nguyen does not require forming the adhesive under any elevated heating conditions and the adhesive is liquid dispensable after forming such that it is considered intrinsic that the adhesive is formed at less than 80 °C. In the event it is shown this limitation is not intrinsic the following rejection would apply. It would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine the forming temperature for the adhesive taught by Nguyen as modified by Jayaraman et al. as doing so would have required nothing more than ordinary skill and routine experimentation.

Regarding claim 14, Nguyen does not specifically teach an actively cooled heat-dissipating surface. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use in the method taught by Nguyen heat-dissipating surfaces that are actively cooled as was well known in the art as shown for example by Jayaraman et al. wherein only the expected results would be achieved.

Regarding claim 33, Nguyen does not specifically teach the curing temperature of the curable polymer is lower than the melting point of the solder. However, as the materials taught by Nguyen, i.e. silicone curable polymer and Sn/Bi, Sn/Pb, Sn/Ag, or Sn/Ag/Cu solder, are consistent and in agreement with those claimed and disclosed by appellants specification it appears intrinsic to Nguyen as modified by Jayaraman et al. that the curing temperature of the curable polymer is lower than the melting point of the solder. In any event, absent any unexpected results it would have been obvious to one or ordinary skill in the art at the time the invention was made to use as the curable polymer and solder powder any of those taught by

Nguyen as modified by Jayaraman et al. including combinations resulting in the curing temperature of the curable polymer lower than the melting point of the solder as doing so would have required nothing more than ordinary skill and routine experimentation.

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen.

Nguyen is described above in full detail. Nguyen does not specifically teach the curing temperature of the curable polymer is lower than the melting point of the solder. However, as the materials taught by Nguyen, i.e. silicone curable polymer and Sn/Bi, Sn/Pb, Sn/Ag, or Sn/Ag/Cu solder, are consistent and in agreement with those claimed and disclosed by appellants specification it appears intrinsic to Nguyen that the curing temperature of the curable polymer is lower than the melting point of the solder. In any event, absent any unexpected results it would have been obvious to one or ordinary skill in the art at the time the invention was made to use as the curable polymer and solder powder any of those taught by Nguyen including combinations resulting in the curing temperature of the curable polymer lower than the melting point of the solder as doing so would have required nothing more than ordinary skill and routine experimentation.

Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of JP2001284401.

Nguyen is described above in full detail. Nguyen is silent as to the percent by volume of solder powder in the adhesive, it being noted Nguyen is not limited to any particular percent by volume. It would have been obvious to one of ordinary skill in the art at the time the invention

was made to experimentally determine the percent by volume of filler including solder powder in the adhesive as a function of the ability to form adequate interconnecting metal structures, adhesive strength of the bond, etc. as doing so would have required nothing more than ordinary skill and routine experimentation, it being optionally noted a percent by volume of solder powder in the claimed range was well known in the art shown for example by JP2001284401.

JP2001284401 discloses a curable adhesive paste comprising 30-50% by volume resin, 30-50% by volume solder powder, and 15-30% by volume flux (See abstract and paragraph 12 of the translation).

Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of JP2001284401.

Claims 2 and 5 are rejected over JP2001284401 set forth in the same manner as applied above to Nguyen in view of JP 2001284401 with it being further noted Jayaraman et al. teach the weight percent of filler is in the range of 10-95% such that a percent by volume within the claimed range would have been further obvious.

Claims 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of JP2001284401.

Claims 2 and 5 are rejected over JP2001284401 set forth in the same manner as applied above to Nguyen in view of JP 2001284401.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Koning et al. (U.S. Patent Application Publication 2003/0150604).

Nguyen is described above in full detail. Nguyen is silent as to a teaching of incorporating metallic particles coated with solder in the adhesive, it being noted Nguyen teaches an adhesive comprising both metallic particles and solder. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the adhesive taught by Nguyen metallic particles coated with solder as was well known in the art as shown for example by Koning et al. to improve the conductive properties of the adhesive.

Koning et al. disclose a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink including those that are actively cooled) through a dispensable liquid curable adhesive paste having a relatively low viscosity. Koning et al. teach the adhesive comprises a liquid curable polymer (e.g. silicon-based) and non-fusible filler (e.g. copper or silver metallic particles having a high melting point, a particle size of 0.025 mm, and a thermal conductivity of 400 W/mK or more) coated with fusible filler such as solder (e.g. Sn/Bi, Sn/Ag, Sn/Ag/Cu, etc. having a melting point less than 235 °C and a thermal conductivity greater than 20 W/mK) wherein coating the non-fusible filler with the fusible filler

serves to improve the conductive properties of the adhesive. Koning et al. teach that after application the adhesive is heated to above the temperature of the solder powder to melt the solder powder and reflow the solder to form interconnecting metal structures and cure the adhesive (Figures 3 and 4 and Paragraphs 11, 22, 27, 28, 30, 38, and 39).

Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Koning et al.

Claim 8 is rejected over Koning et al. set forth in the same manner as applied above to Nguyen in view of Koning et al.

Regarding claim 7, Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied above teach all of the limitations in claim 7 except for a specific teaching of the mean particle size of the metallic particles. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use in Jayaraman et al. as modified by any one of Kirsten, the background of McCormack et al., or Pennisi et al. any well known mean particle size such as 0.025 mm as shown for example by Koning et al. as only the expected results would be achieved.

Koning et al. is described above in full detail.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Koning et al.

Claim 8 is rejected over Koning et al. set forth in the same manner as applied above to Nguyen in view of Koning et al.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Dietz (U.S. Patent 6,265,471).

Nguyen is described above in full detail. Nguyen is silent as to the thermal conductivity of the adhesive, it being noted as the adhesive is consistent and in agreement with that described and claimed by appellant it appears the claimed thermal conductivity in intrinsic to the adhesive taught by Nguyen. In any event as there is no express teaching the following rejection applies, as the adhesive taught by Nguyen is to have optimum thermal conductivity properties it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the thermally conductive adhesive taught by Nguyen to a well known high thermal conductivity such as 45 W/mK or more as shown for example by Dietz as only the expected results would be achieved.

Dietz disclose a highly thermally conductive dispensable liquid curable adhesive paste having a relatively low viscosity that comprises a liquid curable polymer and conductive solder filler having a thermal conductivity of 45 to 65 W/mK (Column 2, lines 28-35 and Column 7, lines 4-8).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Dietz.

Claim 15 is rejected over Dietz set forth in the same manner as applied above to Nguyen in view of Dietz.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Dietz.

Claim 15 is rejected over Dietz set forth in the same manner as applied above to Nguyen in view of Dietz.

Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen in view of Bish et al. (U.S. Patent 6,906,413).

Nguyen is described above in full detail. Nguyen is silent as to the thickness of the applied adhesive, it being noted Nguyen is not limited to any particular thickness. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the adhesive taught by Nguyen to any well known and conventional thickness such as up to 0.2 mm as shown for example by Bish et al. as only the expected results would be achieved.

Bish et al. disclose a method of attaching an electronic component (e.g. integrated circuit (IC) chip) to a heat-dissipating surface (e.g. heat sink) through a curable adhesive paste wherein

the adhesive is applied to the component or surface in a typical thickness of up to 0.2 mm (Column 3, lines 33-56).

Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al. and any one of Kirsten, the background of McCormack et al., or Pennisi et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Bish et al.

Claims 18 and 24-26 are rejected over Bish et al. set forth in the same manner as applied above to Nguyen in view of Bish et al.

Claims 18 and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 1, 3, 4, 6, 9-14, 16, 17, 19-23, 28, 29, 31, and 33 above, and further in view of Bish et al.

Claims 18 and 24-26 are rejected over Bish et al. set forth in the same manner as applied above to Nguyen in view of Bish et al.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Bish et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected over Koning et al. set forth in the same manner as applied above to claim 8 over Nguyen in view of Koning et al.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al., any one of Kirsten, the background of McCormack et al., or Pennisi et al., and Bish et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected over Koning et al. set forth in the same manner as applied above to claim 8 over Nguyen in view of Koning et al.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 18 and 24-26 above, and further in view of Koning et al.

Claim 27 is rejected over Koning et al. set forth in the same manner as applied above to claim 8 over Nguyen in view of Koning et al.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Bish et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected over JP2001284401 set forth in the same manner as applied above to claims 2 and 5 over Nguyen in view of JP 2001284401.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jayaraman et al., any one of Kirsten, the background of McCormack et al., or Pennisi et al., and Bish et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected over JP2001284401 set forth in the same manner as applied above to claims 2 and 5 over Nguyen in view of JP 2001284401.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen and Jayaraman et al. as applied to claims 18 and 24-26 above, and optionally further in view of JP2001284401.

Claim 30 is rejected over JP2001284401 set forth in the same manner as applied above to claims 2 and 5 over Nguyen in view of JP 2001284401.

(10) Response to Argument

Response to Appellants arguments regarding Nguyen:

> Appellant argues, "Here, the Applicant has chosen to use the term "cure" in certain instances and "harden" in others, within the same claims. Thus it is appropriate that the Examiner look to the specification to determine the meaning of the two terms relative to one another. From paragraphs [0020], [0022] and [0027], it can be seen that the Applicant intends "harden" to indicate a particular type of curing, rather than to be a synonym for "cure." Further, from the language of the claims themselves, it is clear that there must be a distinction between the two terms.".

The Examiner agrees with appellants regarding the interpretation of the limitation in claim 1 "thereafter curing the polymer matrix such that the adhesive paste hardens" and the limitation in claim 23 "thereafter curing said polymer such that the adhesive paste hardens" as requiring curing and hardening of the adhesive which limitations are anticipated by Nguyen.

> Appellant further argues, "The Examiner has also contended that the term "harden" means nothing more than to become more firm; however, the Examiner continues to ignore the distinction between the terms "cure" and "harden."".

Claim 1 requires "thereafter curing the polymer matrix such that the adhesive paste hardens" and Claim 23 requires "thereafter curing said polymer such that the adhesive paste hardens". Curing the polymer matrix such that the adhesive paste hardens is considered to cure the polymer such that it becomes harder/more hard. Nguyen teaches dispensing a liquid

adhesive paste and curing the paste into a compliant elastomer which will not degrade during thermal cycling (Paragraphs 15 and 20). Nguyen teaches the physical properties of the cured adhesive can be varied from a very soft gel at a very low crosslink density to a tough elastomer network of higher crosslink density (Paragraph 21). Curing the liquid adhesive paste taught by Nguyen to form a tough, compliant elastomer network of higher crosslink density is considered "curing the polymer matrix such that the adhesive paste hardens". It is further noted appellant describes the cured polymer at paragraph [0022] in that "Finally, after being cured the polymer should provide good adhesion and have sufficient elasticity to absorb any stresses generated by thermal cycling or other mechanical causes.", wherein the compliant elastomer taught by Nguyen is consistent and in agreement with that described by appellant regarding the cured polymer.

> Appellant further argues, "In the Final Office Action, the Examiner contends that the compliant polymer of Nguyen was a hardened polymer, citing Applicant's specification (para. [0022]) as teaching a hardened polymer having elasticity, and concluded that a compliant polymer and a hardened polymer having elasticity were the same. In response to this rejection, Applicant argued that the compliant polymer of Nguyen and a hardened polymer having elasticity were not the same, based upon Applicant's definition of "harden" (as discussed in detail above), and supported by portions of paragraph [0022] that the Examiner did not address. Specifically, Applicant pointed out that the term "hardened" meant a form that could absorb mechanical stresses, rather than being deformed by them (Amendment "B," page 7).".

This argument was addressed in the Advisory Action. Appellants claims are not commensurate in scope with the argument that "the term "hardened" meant a form that could absorb mechanical stresses, rather than being deformed by them". The claims do not describe hardened as meaning a form that can absorb mechanical stresses, <u>rather than being deformed by them</u>, and appellants specification does not describe the same. Rather, appellants specification at paragraph [0022] states "Finally, after being cured the polymer should provide good adhesion and have sufficient elasticity to absorb any stresses generated by thermal cycling or other

mechanical causes.". The specification describes the cured polymer as having sufficient elasticity to absorb any stresses generated by thermal cycling, i.e. considered by the examiner as a compliant material and consistent and in agreement with that taught by Nguyen as shown above. There is nothing in the specification and in particular paragraph [0022] which supports appellants assertion that the term "hardened" meant a form that could absorb mechanical stresses, rather than being deformed by them.

Response to Appellants arguments regarding Jayaraman et al. in view of any one of Kirsten, the background of McCormack et al., or Pennisi et al.:

> Appellant argues, "A phase change polymer, as disclosed in Jayaraman et al., becomes fluid when heated to the operating temperature of an electronic device in which it is used. This ability to change state to a fluid occurs *after* the polymer has already cured. This is a specific difference from the polymer of the present invention, which cures to a hardened form and does not change state in response to further heating (Specification, para. [0022]). Contrary to the Examiner's statement (Advisory Action, page 2), the claims are commensurate in scope with this argument because paragraph [0022] merely provides the *meaning* of the term "harden" as used by Applicant where it describes the polymer as absorbing stresses caused by thermal cycling. Applicant's argument relates to the definition of the claim terms; there is no attempt at broadening or altering the scope of the claims.".

The claims are not commensurate in scope with this argument, and appellants specification does not define "harden" as curing to a hardened form that does not change state in response to further heating. Paragraph [0022] as referred to by appellant does not mention the word "harden" nor does the paragraph state the polymer does not change state in response to further heating. Paragraph [0022] states "Finally, after being cured the polymer should provide good adhesion and have sufficient elasticity to absorb any stresses generated by thermal cycling or other mechanical causes.". Thus, appellants specification states a "cured" polymer should absorb stresses generated by thermal cycling wherein the above does not require a polymer that

does not change state in response to further heating, e.g. paragraph [0022] would describe phase change polymers wherein the thermal cycling temperatures are at a temperature below which the polymer changes phase and also paragraph [0022] would describe phase change polymers wherein the change in phase acts to absorb any stresses generated by thermal cycling. In short the claims merely require "thereafter curing the polymer matrix such that the adhesive paste hardens" wherein Jayaraman et al. teach curing a liquid paste to a solid, i.e. hardened, form at low temperature.

> Appellants further argue, "In the Advisory Action, the Examiner stated that Applicant's argument is not persuasive. Applicant had argued that there is no motivation to combine these references because the addition of fluxing agents to a phase change polymer would destroy the function of the invention. The Examiner contends that Jayaraman et al.'s list of non-fusible fillers included other materials in addition to metal oxides and the relative size of the non-fusible filler particles is larger than that of the fusible filler particles, and concluded that the use of a fluxing agent would 'nave "a negligible impact." However, the Examiner failed to provide any support for this conclusion. Further, none of the motivation cited by the Examiner (noting that the Examiner cited each of Kirsten, McCormack et al. and Pennisi et al. generally) suggests that this combination can be made with a phase change polymer, which, as discussed above, has significant differences in properties from other polymers.".

The Examiner does not agree that the addition of the fluxing agents would destroy the function of Jayaraman et al. As noted above, it is considered obvious to include within the adhesive taught by Jayaraman et al. a fluxing agent to remove surface oxides from the solder powder and allow the solder powder to better wet out. Appellants suggestion that because some of the non-fusible fillers taught by Jayaraman et al. may comprise metal oxides one would not have been motivated to include fluxing agent within the adhesive is not persuasive. Jayaraman et al. suggest ten non-fusible fillers only two of which are metal oxides (Column 10, lines 42-50) such that in the majority of the embodiments suggested by Jayaraman et al. inclusion of a fluxing agent would not have affected the adhesive other than to remove surface oxides from the solder

powder and even in those embodiments wherein non-fusible filler comprises a metal oxide the fluxing agent is added to remove *surface* oxides from the solder powder and absent any evidence otherwise the fluxing agent would not effect the non-fusible filler particles which not only have a size much larger than that of a *surface* oxide but have a much larger size than the solder particle itself (Figures 4A and 4B).

Response to Appellants arguments regarding Nguyen in view of Jayaraman et al.:

> Apellants argue, "The Examiner has asserted that the combination of Jayaraman et al. with the Nguyen reference is merely to show that in a similar process, heated solder powder reflows to form interconnecting metal structures while the curable polymer is cured. The Examiner has not, however, provided any motivation for the combination of these references.".

Nguyen in view of Jayaraman et al. is set forth in the event it is shown Nguyen does not inherently teach reflow of the solder powder to form interconnecting metal structures which appellants have not shown. Jayaraman et al. is provided as evidence of melting of the solder powder and curing of the adhesive in an analogous manner to that taught by Nguyen that the solder powder would reflow to form interconnecting metal structures.

Response to Appellants arguments regarding the additional 35 U.S.C. 103(a) rejections:

No further arguments are made regarding these rejections as noted in sections E. and F. of the Appeal Brief.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

John L. Goff
Primary Examiner
Art Unit 1733

Conferees:

Richard Crispino

Christopher A. Fiorilla